

Notice of Allowability

Application No.

10/602,598

Examiner

Brian E. Miller

Applicant(s)

TAKESHIMA ET AL.

Art Unit

2627

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to IDS filed 4/21/06.
2. ☒ The allowed claim(s) is/are 5-8, 17, 25-28 (renumbered as 1-4, 6, 5, 7-9, respectively).
3. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☒ All b) ☐ Some* c) ☐ None of the:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☒ Certified copies of the priority documents have been received in Application No. 09/842,139.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
 - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☒ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☒ Interview Summary (PTO-413), Paper No./Mail Date 12/13/05.
7. ☒ Examiner's Amendment/Comment
8. ☐ Examiner's Statement of Reasons for Allowance
9. ☒ Other See Continuation Sheet.

Continuation of Attachment(s) 9. Other: machine translation for JP2000057635.

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Claims 5-8, 17, 25-28 are pending.

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after allowance or after an Office action under *Ex Parte Quayle*, 25 USPQ 74, 453 O.G. 213 (Comm'r Pat. 1935). Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, prosecution in this application has been reopened pursuant to 37 CFR 1.114.

Applicant's submission filed on 4/21/06 has been entered.

Supplemental Reasons For Allowance

2. In view of the IDS filed 4/21/06, comments are specifically directed to JP document 2000-057635 and the English machine translation thereof (enclosed herewith). This prior art, while utilizing a similar cured resin, does not teach nor reasonably disclose additionally a print receiving layer having a pattern of concaves, convexes, or a combination thereof, wherein the print-receiving layer comprises a cured resin and the pattern is at least one of formed in or formed of the cured resin.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee.

Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."


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Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brian E. Miller whose telephone number is (571) 272-7578. The examiner can normally be reached on M-TH 6:30am-4:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hoa T. Nguyen can be reached on (571) 272-7579. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


Brian E. Miller
Primary Examiner
Art Unit 2627

BEM
May 1, 2006

* NOTICES *

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1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the optical recording medium which has the surface layer (printing acceptance layer) in which the note by various writing materials and printing by various printers are possible in detail about an optical recording medium. Especially the surface layer in the optical recording medium of this invention is excellent in the printing property by the full color liquid ink jet printer, shelf life, and a printing water resisting property.

[0002]

[Description of the Prior Art] The optical recording medium [reading / by laser / information / optical recording medium / the writing and/or reading] (optical disk) is compared with the conventional record medium, and since storage capacity is large and random access is possible, it is widely used as a record medium in fields, such as audio software, computer software, game software, and electronic publishing.

[0003] An optical recording medium is divided into two kinds of rewriting molds which can eliminate data after informational record, and a reproducible postscript mold and record. The user of CD-RW [CD-R (postscript mold) and CD-RW (rewriting mold)] which are the optical information media of CD method in it is increasing rapidly in recent years. A user can use the information and data of the versatility of a user proper respectively for such CDs, writing in, and CD-R has compatibility only for [CD] playbacks further. Moreover, DVD-R (postscript mold), DVD-RW (rewriting mold), etc. which are the optical recording medium of a DVD method are beginning to spread recently.

[0004] For the user of the above optical recording media, it is desirable to glance at what kind of information is recorded on the medium, and to make it known. Moreover, in the case of the contractor treating the information media of small quantity many forms which put data into a medium and sell a medium to an end user, in the medium front face, having the note nature by various writing materials and the printing nature by various printers is called for from a viewpoint of labeling of goods.

[0005] As the entry approach on the above front faces of a medium, the approach of sticking the label of paper or a film on a medium front face directly is proposed conventionally, and this approach has the advantage that the alphabetic character and picture which were finely designed by the printer can be printed, but on the other hand it has the following faults.

[0006] (1) If a label is partially stuck on a medium front face, rotation blurring occurs under the weight of a label, and it will read at the time of high-speed rotation, and will be easy to generate the error of a signal.

(2) Although the label of a doughnut mold is used when sticking a label all over a medium, the alignment of a medium and a label is very difficult and a location gap of about 0.5mm may arise. Therefore, it becomes easy to generate an error to the readout signal of high-speed rotation.

(3) The label is stuck with the binder, and when being separating, there is a possibility that it may be exfoliated and caught within equipment.

(4) When the label made of paper is stuck, the medium concerned deforms by the moisture absorption and dehumidifying by the environment of a binder and paper.

[0007] The printer only for such media has come to be sold to a field (it is hereafter called a labelled surface) opposite to the optical plane of incidence of an optical recording medium with an optical recording medium printable direct by the above-mentioned reason in recent years. The aqueous liquid ink jet recording method is mostly used as a printing recording method of these printers. And this recording method is widely used from a comparatively cheap and clear full color image being obtained.

[0008] As a means which raises the note nature and printing nature of a labelled surface of an optical recording medium, the optical recording medium in which the protective layer (the outermost layer) which can be printed was formed is proposed by JP,7-169100,A with the ultraviolet-rays hardening resin constituent containing a hydrophilic polymer, a hydrophilic monomer, and organic / inorganic filler of absorptivity / oil absorption nature.

[0009] However, HAJIKI of printing ink is prevented, and ink unabsorbable [although moreover excelled in fixable / of printing ink / by the hydrophilic polymer] since the absorptance and rate of absorption of ink are inadequate spreads, an image becomes indistinct, moreover desiccation of ink is slow, and, as for the protective layer of the above-mentioned optical recording medium, it remains with [of the ink after printing] solid one. Moreover, there is a problem also in a water resisting property -- that in addition to the water resisting property of the protective layer itself not being enough printing ink is eluted by adhesion of water and it will be in a decolorization condition after printing, and printing ink spreads in a high humidity ambient atmosphere.

[0010] The optical information media to which vinyl acetal resin, hydrated alumina, and cationic resin, on the other hand, have the ink absorbing layer contained at a specific rate in JP,9-245379,A as a means to improve a water resisting property is proposed. However, it is necessary to set the above-mentioned ink absorbing layer like the formation fault, and it needs to carry out heat desiccation using hot air drying equipment, a heat drum, etc., therefore its productivity is bad, and it has problems, such as property degradation of the optical information media by heat.

[0011]

[Problem(s) to be Solved by the Invention] It is made in view of the above-mentioned actual condition, and the purpose is the optical recording medium which can be printed, and it has sufficient ink rate of absorption for the printing acceptance layer formed in the front face not to have a blot, and form a clear image by the ink jet, and ink absorptance, and a printing acceptance layer has the water resisting property of itself, and the water resisting property of a printing image formed on a layer, and this invention is to offer the optical recording medium which moreover has high productivity.

[0012]

[Means for Solving the Problem] As a result of repeating examination wholeheartedly, by considering a printing acceptance layer as a specific configuration, this invention persons acquired knowledge that the optical recording medium equipped with the outstanding ink absorptivity and a good water resisting property is obtained, and resulted in completion of this invention.

[0013] That is, the summary of this invention has a printing acceptance layer in the outermost layer of a medium, and consists in the optical recording medium characterized by consisting of the ultraviolet-rays hardening resin constituent with which the printing acceptance layer concerned contains the particle and cation resin of 200nm or less of mean diameters.

[0014]

[Embodiment of the Invention] Hereafter, this invention is explained to a detail. A fundamentally different point of the printing acceptance layer in the optical recording medium of this invention and the conventional printing acceptance layer is the ink absorption mechanism of an ink jet printer.

[0015] That is, the conventional printing acceptance layer made printing possible, when the particle of the absorptivity distributed in the binder resin layer which the resin itself which constitutes a layer has ink absorptivity, or constitutes a layer absorbed ink. On the other hand, in the case of this invention, a detailed opening where ink is absorbed by capillarity in a printing acceptance layer in an instant can be formed by making the particle of the specified quantity contain in a printing acceptance layer. Since according to this approach the flare (blot) in the printing acceptance layer front face of ink can be controlled since ink is so much absorbable, and rate of absorption can be sped up, drying improves and a

clear image can be formed.

[0016] The printing acceptance layer in this invention consists of the ultraviolet-rays hardening resin constituent containing the particle and cation resin of 200nm or less of mean diameters.

[0017] As the above-mentioned particle, the various particles of organic and an inorganic substance are mentioned. For example, as a particle which consists of the organic substance, natural resin particles, such as synthetic-resin particles, such as PMMA resin, polystyrene resin, an epoxy resin, a fluororesin, silicon resin, and polyester resin, a collagen, a silk, and a cotton, are mentioned. As a particle which consists of an inorganic substance, the oxide of various metals, such as aluminum besides talc and a mica, magnesium, zinc, iron, manganese, and titanium, a ceramic, etc. are mentioned. It is difficult to atomize in particle size of 100nm or less, and since the particle which consists of the organic substance has the inclination for thermal resistance, a water resisting property, solvent-proof nature, etc. to be inferior, its inorganic substance particle is desirable. In an inorganic substance particle, the metallic oxide of various kinds [point / that atomization is easy] is desirable. Specific surface area is large, a detailed opening can be formed, since a front face is moreover a hydrophilic property, especially a silica has good concordance with water color ink, and it is suitable for it.

[0018] A synthetic silica is recommended from the point that control of particle size, specific surface area, etc. is possible, and the particle of a uniform property is obtained in a globular form according to a manufacturing method. Although there are dry process and a wet method in the synthesis method of a synthetic silica, a wet method is good in order to obtain a silica with a large specific surface area by porosity. Furthermore, any are sufficient although there are settling and the gel method in a wet method.

[0019] The magnitude of the opening which a particle has has a viewpoint to the desirable range of several nm thru/or several 10nm which absorbs the ink of an ink jet effectively. Although the printing acceptance layer in this invention contains a particle and cation resin, in order to obtain the above detailed openings effectively, the dispersibility and particle size in the ultraviolet-rays hardening resin constituent of a particle are important for it.

[0020] The mean particle diameter of a particle must be 200nm or less in order to obtain detailed and high voidage. That is, when mean particle diameter exceeds 200nm, the opening formed between particles makes it big and rough, the absorptance and rate of absorption of ink fall, and sufficient ink receptiveness is not acquired. Moreover, ultraviolet-rays permeability becomes low, since photo-curing of a printing acceptance layer is not fully performed, it is hard to harden the interior of a layer, and there is an inclination to be inferior to productivity. 1-100nm of mean particle diameter of a particle is 2-50nm still more preferably preferably. When a mean diameter is less than 1nm, in order that the opening which the dispersibility to binder resin tends to fall, and is formed between particles may make it detailed too much, there is an inclination for sufficient ink receptiveness not to be acquired.

[0021] The loadings of the particle in a printing acceptance layer are less than 100 % of the weight 30 % of the weight or more to the ultraviolet-rays hardening resin constituent which forms a printing acceptance layer, and are 90 or less % of the weight 35 % of the weight or more 95 or less % of the weight 30 % of the weight or more still more preferably preferably. At less than 30 % of the weight, formation of the opening of magnitude required for ink absorption is difficult.

[0022] It is thought that the cation resin contained in an ultraviolet-rays hardening resin constituent has the work which insolubilizes ink in order to give a water resisting property to the image printed by the ink jet. Generally the anionic aqueous color is used for the ink for ink jet printers, by addition of cation resin, the color in the ink by which the detailed opening was adsorbed can be insolubilized in water, and the water resisting property of a formation image can be given.

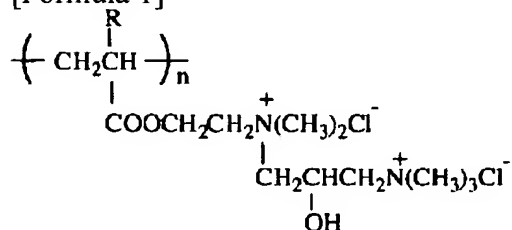
[0023] although it will not be restricted as cation resin which can be used for this invention especially if a cationic part is included in intramolecular -- weight average molecular weight -- usually -- 500-200,000 -- it considers as the range of 1,000-100,000 preferably. When weight average molecular weight is less than 500, the water resisting property of an image tends to be inferior, and since there is an inclination for joint effectiveness with the color molecule by molecular structure-steric hindrance to worsen when exceeding 200,000, the effectiveness by minute amount addition becomes small.

[0024] As an example of cation resin, the copolymer of the cation conversion object of polyacrylamide,

acrylamide, and a cationic monomer, the copolymer of the cation denaturation object of the 3rd class amino-group content (meta) acrylate and other general monomers, the poly allylamine, a polyamine sulfone, a polyvinyl amine, polyethyleneimine, polyamide epichlorohydrin, polyvinyl pyridinium halide, etc. are mentioned. Moreover, the copolymer of a vinyl-pyrrolidone system monomer, a vinyl oxazolidone system monomer or a vinyl imidazole system monomer, and other general monomers is mentioned. Furthermore, the copolymer of the cation conversion object of the 3rd class amino-group content (meta) acrylate expressed with the following general formula and other general monomers is mentioned. R expresses a hydrogen atom or a methyl group among the following general formulas.

[0025]

[Formula 1]



[0026] By the way, as a means to form a printing acceptance layer in paper or a film, the constituent which contained the resin of fusibility in water or other solvents as a binder is applied, and, generally the approach of drying is learned. In this case, though natural, the own water resisting property of a printing acceptance layer and solvent-proof nature are weak. Moreover, the drying time is required for several [at least] minutes, and is not desirable in respect of productivity in the production process of an optical recording medium. Moreover, there is also a possibility that the property of a medium may deteriorate, under the effect of desiccation heat. On the other hand, in this invention, the own water resisting property of a layer and solvent-proof nature can form a high printing acceptance layer by using the resin constituent (ultraviolet-rays hardening resin constituent) which uses ultraviolet-rays (UV) hardening resin as a binder.

[0027] Although UV hardening resin has radical reaction type resin and ionic reaction type resin, since ionic reaction type resin has the slow rate of reaction, generally radical reaction type resin is used suitably.

[0028] At least, a resin monomer component and a photopolymerization initiator are used for radical reaction type UV hardening resin, and it is usually further prepared using a resin oligomer component if needed. The printing acceptance layer of various properties can be obtained by choosing various resin monomer components and resin oligomer components. That is, viscosity, a degree of hardness, etc. change with the classes and amounts of a resin monomer component, and a degree of hardness, adhesion, a water resisting property, moisture resistance, etc. change with the classes and amounts of a resin oligomer component.

[0029] As a resin monomer component, you may be any of monofunctional or polyfunctional monomer. In order to raise the crosslinking density in a printing acceptance layer and to hold reinforcement, that of constant-rate **** is desirable in a polyfunctional monomer component.

[0030] As a monofunctional monomer, for example 2-ethylhexyl acrylate, 2-hydroxyethyl acrylate, 2-hydroxypropyl acrylate, Phenoxy ethyl acrylate, nonylphenoxyethyl acrylate, N-vinyl pyrrolidone, 2-hydroxyethyl acryloyl phosphate, Tetrahydrofurfuryl acrylate, tetrahydrofurfuryl oxy-ethyl acrylate, Acrylate [of epsilon-caprolactone addition product of tetrahydrofurfuryl oxy-HEKISANORIDO acrylate, 1, and 3-dioxane alcohol], 1, and 3-dioxolane acrylate etc. is mentioned.

[0031] As a polyfunctional monomer component, cyclo pen TENIRU acrylate, 1,6-hexanediol diacrylate, Diethylene glycol diacrylate, tripropylene glycol diacrylate, Neopentyl glycol diacrylate, polyethylene-glycol (400) diacrylate, Hydroxy pivalate ester neopentyl glycol diacrylate, The diacrylate of a neopentyl glycol horse mackerel peat, the diacrylate of epsilon-caprolactone addition product of hydroxy pivalate neopentyl glycol, 2-(2-hydroxy - 1 and 1-dimethyl ethyl)-5-hydroxymethyl-5-ethyl -1,

3-dioxane diacrylate, epsilon-caprolactone addition product of tricyclodecanedimethylol diacrylate and tricyclodecanedimethylol diacrylate, Trimethylolpropane triacrylate, a pentaerythritol thoria chestnut rate, Dipentaerythritol hexaacrylate, a propionic acid and dipentaerythritol thoria KURITO, Hydroxypivalaldehyde denaturation dimethylol pro pantry acrylate, the tetraacrylate of a propionic acid and dipentaerythritol, ditrimethylolpropanetetraacrylate, etc. are mentioned.

[0032] As a resin oligomer component, acrylic oligomer, ester system oligomer, urethane system oligomer, ether system oligomer, etc. are mentioned. Although these may be used independently, if it is used combining two or more sorts, a printing acceptance layer with a respectively different property will be obtained. For example, if ester system oligomer is used with acrylic oligomer, it excels in a water resisting property and a hard layer can be obtained. In this case, although curvature may arise to a medium since hardening contraction is large, it is solvable by giving the curvature of hard flow to the substrate beforehand. On the other hand, if urethane system oligomer is used with acrylic oligomer, since molecular weight is large and urethane system oligomer has small hardening contraction, possibility that the curvature of a substrate etc. will arise will become small. in this case, the thing which has the formed comparatively soft hardening paint film -- ** -- it becomes.

[0033] As the above-mentioned acrylic oligomer, for example An acrylic acid (meta), The polymer of alkyl (meta) acrylate, such as a methyl acrylate, an ethyl acrylate (meta), acrylic-acid (meta) propyl, and butyl acrylate (meta), (Meta) Or aromatic series vinyl compounds, such as the above-mentioned monomer, styrene and alpha methyl styrene, and a vinyl (o, m, p) phenol, Vinyl carboxylic-acid compounds, such as a maleic acid, an itaconic acid, a crotonic acid, and a fumaric acid, Glycidyl (meta) acrylate, allyl glycidyl ether, ethyl metaglycidyl acrylate, Glycidyl group content vinyl compounds, such as crotonylglycidyl ether and crotonic-acid glycidyl, Aromatic series acrylate compounds, such as benzyl (meta) acrylate, hydroxyethyl (meta) acrylate, Permutation alkyl acrylate compounds, such as N and N-dimethylaminoethyl (meta) acrylate, Acrylamide, N-methylol (meta) acrylamide, (Meta) Acrylamide system compounds, such as N and N-dimethyl (meta) acrylamide, N, and N-dimethylaminoethyl (meta) acrylamide, A copolymer with the compound chosen from vinyl acetate, acrylonitrile (meta), acrylic-acid (meta) chloride, N-(meta) acryloyl morpholine, etc. is mentioned.

[0034] the above-mentioned ester system oligomer -- carrying out -- for example, the ester of the polyester diol and the acrylic acid which consist of the ring-opening-polymerization object of phthalic anhydride and propylene oxide, the ester of the polyester diol and the acrylic acid which consist of adipic-acid 1,6-hexanediol, the ester of the triol and the acrylic acid which consist of a reactant with a trimellitic acid diethylene glycol, the ester of the ring-opening-polymerization object of delta-valerolactone and an acrylic acid, etc. are mentioned.

[0035] As the above-mentioned urethane system oligomer, the thing which made 2-hydroxyethyl acrylate react to the diisocyanate oligomer to which the reactant of the polyurethane and 2-hydroxyethyl acrylate which consist of hexamethylene di-isocyanate and 1,6-hexanediol, and an adipic acid, the polyester diol which consists of 1,6-hexanediol and tolylene diisocyanate were made to react is mentioned, for example.

[0036] As the above-mentioned ether system oligomer, the ester of a polypropylene glycol and an acrylic acid etc. is mentioned, for example. In addition, epoxy system oligomer, polyarylate, etc. which made acrylate react to an epoxy resin can be used as a resin oligomer component.

[0037] As a photopolymerization initiator, for example Benzoin iso-propyl ether, A benzophenone, 2-hydroxy-2-methylpropiohenone, 1-hydroxy cyclohexyl phenyl ketone, 2, 4-diethyl thioxan ton, o-HENZOIRU methyl benzoate, 4 and 4-screw diethylamino benzophenone, 2, and 2-diethoxy aceto FEN, Benzyl, 2-chloro thioxan ton, diisopropyl thio ZANSON, 9,10-anthraquinone, BENSOIN, BENSO in methyl ether, A 2 and 2-dimethoxy-2-phenyl acetophenone, 2-hydroxy-2-methyl-propiohenone, 4-isopropyl-2-hydroxy-2-methylpropiohenone, alpha, and alpha-dimethoxy-alpha-phenyl acetone etc. is mentioned.

[0038] The ultraviolet-rays hardening resin constituent may contain binder resin other than a terminator, a preservation stabilizer, a dispersant, a defoaming agent, and ultraviolet-rays hardenability resin etc. if needed besides the above.

[0039] According to a conventional method, the printing acceptance layer in this invention is obtained by carrying out UV irradiation, after applying the aforementioned ultraviolet-rays hardening resin constituent by approaches, such as a spin coat method, a dip coating method, the bar coat method, the blade coat method, the air knife coat method, the roll coat method, and screen printing. By the way, since the screen printer of an ultraviolet curing mold is used for label printing of an optical disk etc., the equipment and process time amount of a printing acceptance layer formation process are usually greatly improved by using also [printing machines / these] and forming by screen-stencil.

[0040] As the light source of UV irradiation, a high pressure mercury vapor lamp, a metal halide lamp, etc. are used. and the amount of exposure energy -- usually -- 150 - 2000 mJ/cm² -- it is preferably chosen from the range of 250 - 1000 mJ/cm². Under the present circumstances, in order that a paint film may harden in several seconds, it excels in productivity, but as the formation approach, when screen printing is used, it is desirable to add a leveling agent in order to emit smoothing of a paint film front face and the air bubbles from a paint film in an instant and to raise the glossiness of a paint film side. As a leveling agent, silicon etc. is desirable.

[0041] On a transparence substrate, the optical recording medium of this invention carries out the laminating of a recording layer, a light reflex layer, and the printing acceptance layer at least, and changes, and it is desirable that the printing acceptance layer forms the outermost layer. Even if the printing acceptance layer serves as the protective layer, apart from the printing acceptance layer, you may have the protective layer.

[0042] Although especially the class of resin of a protective layer is not restricted apart from a printing acceptance layer when preparing a protective layer, ultraviolet-rays hardening resin is desirable like the case of a printing acceptance layer. Although what was specifically previously illustrated for being usable in a printing acceptance layer, and the same thing are mentioned and the approach same also as the stratification approach as a printing acceptance layer is mentioned, a spin coat method is the most common especially. There may be a protective layer more than two-layer if needed. And the protective layer of one layer may be prepared in the middle of a protective layer and a printing acceptance layer for the purpose, such as grant of abrasion-proof nature, and adjustment of a color tone.

[0043] As a transparence substrate, inorganic materials, such as glass besides polymeric materials, such as polycarbonate resin, acrylic resin, polystyrene resin, vinyl chloride resin, an epoxy resin, polyester resin, and amorphous polyolefine, are used, for example. Since [that the permeability of light is high and] especially polycarbonate system resin has small optical anisotropy, it is desirable.

[0044] A guide rail, a pit, etc. where a transparence substrate usually expresses a record location with the front face are formed (groove information etc.). Although groove information etc. is usually given in case it makes a substrate by injection molding or casting, it may be produced from the laser cutting method or 2P law (Photo-Polymer law).

[0045] By the exposure of laser light, especially as long as a recording layer is recordable, it may not be restricted, but it may be any of the recording layer by mineral matter, and the recording layer by the organic substance.

[0046] Rare earth transition-metals alloys which record for example, according to a light-and-heat magnetic effect, such as Tb-Fe-Co and Dy-Fe-Co, are used for the recording layer by mineral matter. Moreover, a chalcogen system alloy like germanium-Te and germanium-Sb-Te which carries out a phase change can also be used.

[0047] Organic coloring matter is mainly used for the recording layer by the organic substance. As this organic coloring matter, large annular aza-annulene system coloring matter (phthalocyanine dye, naphthalocyanine dye, porphyrin coloring matter, etc.), poly methine system coloring matter (cyanine dye, merocyanine coloring matter, SUTAWARIRIUMU coloring matter, etc.), anthraquinone system coloring matter, AZURENIUMU system coloring matter, metal-containing azo system coloring matter, metal-containing India aniline system coloring matter, etc. are mentioned. Since especially metal-containing azo system coloring matter is excellent in endurance and lightfastness, it is desirable.

[0048] A coloring matter content recording layer is usually formed by the methods of application, such as a spin coat, a spray coat, a DIP coat, and a roll coat. Under the present circumstances, as a solvent,

hydroxyethyl solvents, such as perfluoroalkyl alcoholic solvents, such as cellosolve solvents, such as ketone-alcohol solvents, such as diacetone alcohol and 3-hydroxy-3-methyl-2-butanone, methyl cellosolve, and ethylcellosolve, TETORO fluoro propanol, and an octafluoro pentanol, methyl lactate, and isobutyric-acid methyl, are used suitably.

[0049] Although it consists of gold, silver, aluminum, etc., especially when using organic coloring matter for a recording layer, as for a light reflex layer, it is usually desirable that silver constitutes. A metallic reflective layer is formed by vacuum deposition, the sputtering method, and the ion plating method. In addition, in order to raise the adhesion force between layers between a metallic reflective layer and a recording layer, an interlayer may be prepared for the purpose, such as raising a reflection factor.

[0050] For the above-mentioned record layer thickness, the thickness of 10-5000nm and a light reflex layer is [5-50 micrometers and the protection layer thickness of the thickness of 50-200nm and a printing acceptance layer] usually 1-10 micrometers.

[0051] When the thickness of a printing acceptance layer is less than 5 micrometers, it is difficult to secure the opening volume required for absorption of ink, and since unabsorbable ink remains in an acceptance layer front face, it may become the cause of a blot of an image. On the contrary, when thickness exceeds 50 micrometers, absorption and osmosis of ink advance to the interior of a layer, the color enhancement of the ink of an acceptance layer front face falls, and the clear nature of an image falls. Furthermore, diactinism is inferior in the case of UV irradiation, and there is a possibility of causing the lack of hardening inside a layer.

[0052] In order to raise the printing property of the print at the time of carrying out full color printing in the outermost layer, particles, such as titanium oxide, may be made to contain and may be made to whiten in the optical recording medium of this invention in the protective layer which carries out a laminating on the metallic reflection film.

[0053]

[Example] Hereafter, although an example explains this invention to a detail further, this invention is not limited to the following examples, unless the summary is exceeded.

[0054] The solution of metal-containing azo dye is dropped on an injection molding polycarbonate resin base (diameter of 120mm) with an example 1 depth [of 1600A], and a width of face of 0.45 micrometers with a slot (groove), and it applies at the rotational frequency of 500rpm with a spin coat method, it dries for 30 minutes at 90 degrees C, and a recording layer is formed.

[0055] Subsequently, on the above-mentioned recording layer, the sputtering method is resembled, more, the silver film of 800A (80nm) of thickness is formed, and a reflecting layer is formed. And after carrying out the spin coat of the ultraviolet-rays hardenability resin all over this reflecting layer, ultraviolet rays are irradiated, and are stiffened and a 5-micrometer protective layer is formed.

Furthermore, after applying the ultraviolet-rays hardening resin constituent of the presentation shown in degree table all over the above-mentioned protective layer by screen-stencil, ultraviolet rays are irradiated, and are stiffened and the printing acceptance layer of 20 micrometers of thickness is formed.

[0056]

[Table 1]

シリカ 一次平均粒径：10nm 比表面積：250m ² /g 細孔容積：(Hg法) 3.0ml/g 真密度：2.1	50重量部
アクリロイルモルホリン	35重量部
ヒドロキシエチルアクリレート	10重量部
三菱化学(株)製カチオン樹脂 「サフトマー」	3重量部
2-ヒドロキシ-2-メチル-1-フェ ニル-プロパン-1-オン (光重合開始剤)	2重量部

[0057] It prints by the product "CD-ColerPrinter" made from Fargo in the printing acceptance layer of the optical recording medium obtained above, and printing ink absorptivity, the water resisting property of an image, and the waterproof reinforcement of an acceptance layer are measured and evaluated according to the following approach.

[0058] (1) Printing ink absorptivity : perform solid printing like drawing 1 by cyanogen, MAZENDA, yellow, and two different colors A and B chosen from four colors of black (the combination of colors A and B is 12 kinds), and viewing estimates extent [section / of two colors each / boundary] of a blot. When there were not a blot and color mixture between unique, the blot and color mixture between O and unique were seen a little and the blot and color mixture between ** and unique were intense, it considered as x.

[0059] (2) The water resisting property of an image : solid printing like drawing 1 is performed by cyanogen, MAZENDA, yellow, and two different colors A and B chosen from four colors of black (the combination of colors A and B is 12 kinds), and one cc of **** is dropped at an image part 1 hour after. After leaving it for 1 minute at a room temperature, it wipes off with the wiper for clean rooms (BEMCOT by Asahi Chemical Co., Ltd.), and viewing estimates the elution condition of the ink of an image part. Ink was not eluted, but when there was also no change of a color, O and ink were eluted, when the color of the image of the part which trickled water became a little thin, ** and ink were eluted, and when the color of the image of the part which trickled water became quite thin, it considered as x.

[0060] (3): of an acceptance layer on the strength [waterproof] -- after 5 minutes after keeping the optical recording medium which prepared the printing acceptance layer for three days under 25 degrees C / the 80%RH environment new -- East Science tabulation planar testing-machine machine try BOGIA 14S type performs the pencil determination of hardness, and the reinforcement of an acceptance layer is measured. In O and F-B, it was made into case [below ** and 2B] x when the **** degree of hardness which is not obtained was more than H.

[0061]

[Effect of the Invention] According to this invention explained above, it is the optical recording medium which can be printed and the optical recording medium excellent in the printing property of a full color liquid ink jet printer, shelf life, and a printing water resisting property can be offered.

[Translation done.]